

Claims

1. A process for the preparation of a micron-scale film of $\text{YBa}_2\text{Cu}_3\text{O}_{7-y}$ ($y \leq 0.08$) on a substrate, which consists in spraying an aqueous solution of precursors of the chemical elements to be deposited, in order to form an aerosol, in
5 transporting the aerosol using a carrier gas from its source to a reaction region, where it comes into contact with the surface of a heated substrate, on which surface it undergoes pyrolysis, followed by an annealing operation, characterized in that:
- 10 a) the precursor solution is a solution of yttrium nitrate, barium nitrate and copper nitrate, in which the total nitrate concentration is substantially equal to the saturation concentration, and the relative concentrations of the various precursors in the solution are such that
15 $0.11 \leq F_Y \leq 0.28$, $0.46 \leq F_{Ba} \leq 0.58$, $0.2 \leq F_{Cu} \leq 0.37$, F_Y , F_{Ba} and F_{Cu} being the respective atomic fractions of the cations;
- b) the precursor solution is sprayed for a time ranging from 1 minute to 5 minutes;
- 20 c) the carrier gas is an inert gas, the flow rate of which is such that it generates a laminar flow in the environment of the forming film;
- d) the pyrolysis is carried out on the heated substrate at the temperature between 800°C and 870°C ; and
- 25 e) the annealing is carried out in oxygen, at a temperature between 850°C and 880°C and at least 10°C higher than the pyrolysis temperature during a first step for a time of 1 to 2 hours, then at a temperature between 450°C and 550°C during a second step for a time of 0.5 to 1.5 hours.
- 30 2. The process as claimed in claim 1, characterized in that the copper precursor is $\text{Cu}(\text{NO}_3)_2 \cdot n\text{H}_2\text{O}$, $n \geq 2.5$.
3. The process as claimed in claim 1, characterized in that the yttrium precursor is yttrium nitrate $\text{Y}(\text{NO}_3)_3 \cdot m\text{H}_2\text{O}$, $m \geq 4$.
- 35 4. The process as claimed in claim 1, characterized in that barium precursor is $\text{Ba}(\text{NO}_3)_2$.

5. The process as claimed in claim 1, characterized in that the respective proportions of the various nitrates in the precursor solution are such that $FY = 0.2$, $Ba = 0.56$ and $Cu = 0.27$.

5 6. The process as claimed in claim 1, characterized in that the substrate on which the $YBa_2Cu_3O_{7-y}$ film is deposited is chosen from MgO , LAO ($LaAlO_3$), STO ($SrTiO_3$), a nontextured Ag metal substrate and a biaxially textured Ag substrate, or an yttria-stabilized ZrO_2 (YSZ) substrate or a nickel
10 substrate.

7. The process as claimed in claim 1, characterized in that the carrier gas used for transporting the aerosol may be chosen from argon and nitrogen.

8. The process as claimed in claim 1, characterized in
15 that the spraying in step b) is carried out for a time of greater than 3 minutes.

9. A substrate coated with a micron-scale film of $YBa_2Cu_3O_{7-y}$ ($y \leq 0.08$), obtained by a process as claimed in one of claims 1 to 8.